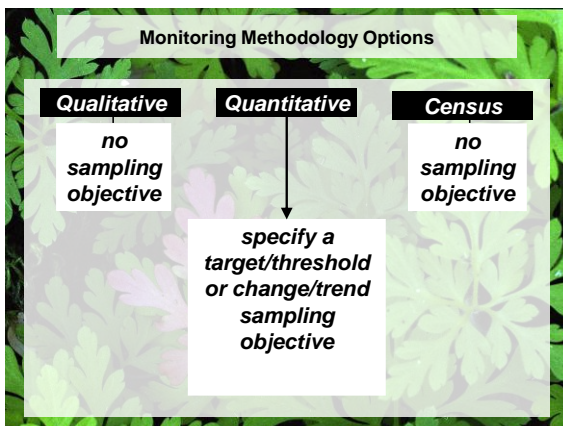**4: Setting Sampling Objectives**

1. **Identify which types of *management objectives* require complementary *sampling objectives*.**

2. **Identify the components needed for Change/Trend and Target/Threshold sampling objectives.**

3. **After completing exercise 3c, write complementary sampling objectives for two management objectives.**

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Monitoring Methodology Options

Qualitative

no sampling objective

Quantitative

specify a target/threshold or change/trend sampling objective

Census

no sampling objective

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Monitoring Methodology Options

1. Management Objective:
Maintain at least 25 individuals of *Penstemon lemhiensis* at the study site during the next 10 years.

Census, no sampling objective

2. Management Objective:
Maintain at least 5000 individuals of *P. lemhiensis* at the study site during the next 10 years.

Quantitative sampling, t/t sampling objective

Monitoring Methodology Options

3. Management Objective:
Maintain the knapweed-free condition of the *P. lemhiensis* population at the study site during the next 10 years.
Qualitative assessment, no sampling objective

4. Management Objective:
Allow for no more than a 10% increase in cover of *Bromus tectorum* at the study site during the next 10 years.

Quantitative sampling, c/t sampling objective

Monitoring Methodology Options

Qualitative	*Quantitative*	*Census*
no sampling objective		*no sampling objective*

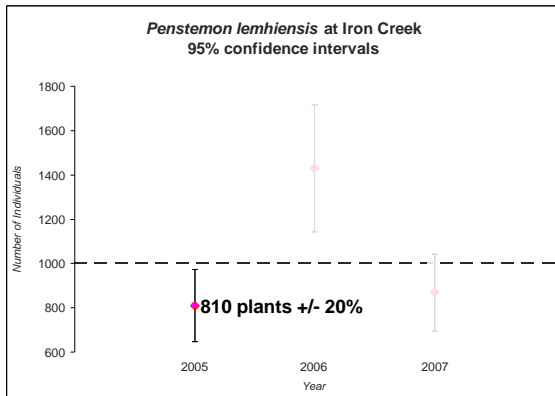| *Target/Threshold*	*Change/Trend*
▪ *confidence level* ▪ *confidence interval width*	▪ *missed-change error rate* ▪ *false-change error rate* ▪ *minimum detectable change*

Target/threshold

1. **Confidence level.** How certain do you want to be that your confidence interval will contain the true value?

2. **Confidence interval width.** How wide of a range will you accept around your estimated true value?

Penstemon lemhiensis at Iron Creek
95% confidence intervals

Number of Individuals

1800
1600
1400
1200
1000
800 — **810 plants +/- 20%**
600

2005   2006   2007

Year

Target/threshold

Management Objective:
Increase the number of individuals of *Penstemon lemhiensis* in the Iron Creek population to 1,000 individuals by 2010.

Sampling Objective:

We want to be 95% certain that population estimates are within 20% of the estimated value.

confidence interval   *confidence level*

Change/Trend

1. Power (1 - missed-change error). How certain do you want to be that, if a particular change does occur, you will be able to detect it?

2. False-change error. How much risk do you want to take of mistakenly detecting a change when none occurred?

3. Minimum detectable change. What is the smallest change that you want to be able to detect?

Change/trend
Management Objectives

Lomatium cookii at Agate Desert Preserve
95% confidence intervals
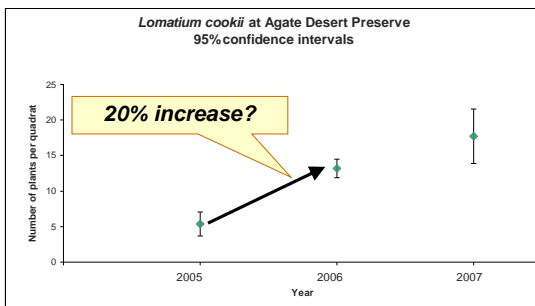
20% increase?

Change/Trend

Management Objective:
I want to see a 20% increase in the density of *Lomatium cookii* at the Agate Desert Preserve between 2005 and 2010.

Sampling Objective:
I want to be 90% certain of detecting a 20% increase in density, and I am willing to accept a 10% chance that I will make a false-change error.

false-change

min. detectable change

power (1 - missed-change)